USAWC STRATEGY RESEARCH PROJECT

**INFORMATION TECHNOLOGY – INFORMATION
OVERLOAD FOR STRATEGIC LEADERS**

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ABSTRACT

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Technology has provided senior leaders with a plethora of "battlefield" information literally at their fingertips. Thousands of miles from the fight,"reachback" capability has provided senior leaders near real time information in the decision-making process. With the advent of technology, information has grown from an insightful strategic leadership tool to one that has burdened leaders with information overload. The tradeoff of this proliferation of information is the possibility of increased stress for Soldiers, Sailors, Airmen and Marines as well as the blending of operational and tactical levels of war. Information technology has also eroded the concept of centralized control and decentralized execution. This paper seeks to identify weaknesses associated with information technology and increase the awareness of its undesired effects.   The paper will first describe systems essential to network - centric warfare and then transition to the drawbacks information overload, a product of network - centric warfare has on operators, senior leaders and organizations. It will conclude with considerations needed to ensure information technology is seen as a commodity and not a detriment.

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LIST OF ILLUSTRATIONS

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INFORMATION TECHNOLOGY - INFORMATION OVERLOAD FOR STRATEGIC LEADERS

> Military transformation will enable the U.S. Armed Forces to achieve broad and sustained competitive advantage in the 21st century. It comprises those activities that anticipate and create the future by coevolving concepts, processes, organizations, and technologies to produce new sources of military power. The transformation of our armed forces will dramatically increase our strategic and operational responsiveness, speed, reach, and effectiveness, making our forces increasingly precise, lethal, tailorable, agile, survivable, and more easily sustainable.

> - Military Transformation Vision for the Department of Defense

The world has seen a tremendous explosion in technology over the past several decades. Information technology has improved and become more plentiful and affordable. The United States Armed Forces is well on its way in taking advantage of the benefits associated with the information boom. The theory of war used to maximize the effects of the information age is known as network - centric warfare (NCW). The Joint Operations Concept and its subordinate Joint Operating Concepts, architectures, requirements, and capabilities will encapsulate the vision of a transforming network-centric joint force and a capabilities-based defense strategy designed to attain the six operational goals established by the Secretary of Defense.[1] Used correctly, this technology provides the warfighter valuable situational awareness of the battlefield. The NCW creates situation awareness through the overlay of "three NCW grids— sensor grid, the command and control or information grid, and the engagement or shooter grid – (which) combine to enable rapid, precise offensive and defense action."[2] Senior leaders expect high dividends with the onslaught of technically advanced systems. However, when it comes to information, it turns out that one can have too much of a good thing.[3] With the advent of technology, information has grown from an insightful strategic leadership tool to one that has burdened leaders with "information overload." The tradeoff of this proliferation of information is the possibility of increased stress for Soldiers, Sailors, Airmen and Marines as well as the blending of operational and tactical levels of war. Information technology has also eroded the concept of centralized control and decentralized execution. This paper seeks to identify weaknesses associated with information technology and increase the awareness of its undesired effects. The paper will first describe systems essential to NCW and then transition to the drawbacks information overload, a product of NCW has on operators, senior leaders and organizations. It will conclude with considerations needed to ensure information technology is seen as a commodity and not a detriment.

SYSTEMS

There is little question that growth of information availability is changing the conduct of war. Information is an essential foundation of knowledge-based warfare. It enables commanders to coordinate, integrate and synchronize combat functions on the battlefield.[4] The Department of Defense (DOD) is heavily invested in its ability to "harness advantages in information technology to link up different kinds of U.S. forces so they can fight jointly."[5] A networked force conducting network-centric operations is an essential enabler for the conduct of effects-based operations by U.S. forces.[6] Information Operations (IO) provides the means to rapidly collect, process, disseminate and protect information while denying these capabilities to adversaries. It represents a critical capability enhancement for transformed forces.[7] IO capitalizes on the growing sophistication, connectivity, and reliance on information technology. [8]

The DOD will invest over $1.8 billion in communications and intelligence activities in fiscal year 2005.[9] Included in the budget is $408 million to continue development of Space Based Radar (SBR) to provide an ability to monitor both fixed and mobile targets. An additional $775 million has been earmarked for the Transformational Communications Satellite (TSAT) system, which will have the capability transmit data that currently takes up to twelve minutes, in less than one second. The Joint Tactical Radio System has been allocated $600 million, which will provide Internet protocol-based, wireless networking capability to the warfighter. [10] The U.S. Army will invest $4.2 billion on the Future Combat System that leverages information connectivity as a key to success. The U.S. Army, together with the joint community, is relentlessly addressing architectures, protocols, and systems of redundant, nonterrestrial networks capable of providing the necessary bandwidth to support such information weapon systems.

The Global Command and Control System (GCCS) is the DOD joint command and control system used to provide accurate, complete, and timely information for the operational chain of command. GCCS consists of the hardware, software, common procedures, standards, and interfaces that make up an "operational architecture" and provides worldwide connectivity with all levels of command. GCCS incorporates systems that provide situational awareness, support for intelligence, force planning, readiness assessment, and deployment applications that battlefield commanders require to effectively plan and execute joint military operations. Yet another concept called Command and Control, Communications, Computer and Intelligence for the Warrior is committed to the challenge of meeting the warfighter's quest for information needed to achieve victory for any mission, at any time and at any place.[11] This broadly connected joint system has the vision to provide total battlespace information to the warfighter.

Command and control architecture from the U.S. Army in the form of LANDWARnet, the U.S. Air Force's Command and Control (C2) constellation and the U.S. Navy's FORCEnet, will reflect common interoperability via the Joint Forces Command's Joint Battle Management Command and Control Transformation Roadmap.

It is clear the DOD sees advancements in information technology as the future of warfare. However, there are drawbacks in the "digitization" transformation. The next sections address the problems that senior leaders and subordinates face.

INFORMATION PROLIFERATION

David Shenk, author of *Concept of Information Overload*, describes our over abundance of information as a "weed in our information landscape (that) has just sprouted - - it is only about 50 years old."[12] Around the time of the first atomic bomb, the world began to produce information much faster than it could process. The ability to process the three fundamental stages of communications—production, distribution and processing of data are no longer synchronized.[13] In 1850, 4% of U.S. workers handled information for a living; now most do, and information processing (as opposed to material goods) now account for more than half of the U.S. gross national product.[14] "Information is now so inexpensive and plentiful that most of it ends up being remaindered and shredded, as if it is worthless garbage. Therein lies the first great paradox…we are becoming so information-rich that we take much of what we have for granted."[15] How much of the information in our midst is useful, and how much of it is a nuisance that wastes our time? Said another way, how much valuable time is utilized wading through useless information? Our society, which includes the DOD, has seen gluttony of information in the past several decades spawning what has been coined "data smog."

The most prolific form of "data smog" is electronic mail (e-mail). Widespread e-mail use has grown as an offshoot of the Internet and today has become an integral method of private and public communication. A study conducted by Rogen International and Goldhaber Research Associates found that in 1995, employees sent an average of three emails a day and received five. By 2002, employees were sending 20 a day and receiving 30.[16]

For example:

- In the office environment, an average of 60% of each person's time is now processing documents.
- 80% of all Internet users in the U.S. use e-mail as a communication medium.[17]
- By the end of 2005, the prediction is there will be 983 million mailboxes with over thirty-five billion messages worldwide.[18]

In an April 2004 speech to the National Defense Industrial Association in Arlington, Virginia, General John P. Jumper, U.S. Air Force Chief of Staff, characterized today's environment as follows:

> It's just like we all get sucked into in this computer world, we're sitting there asking, when we buy our PC, our next desktop, what questions are we asking? I want the e-flat, double clutch, 1.2-gigahertz processor. Why? Then what are you going to do? You're going to buy this computer and then what are you going to do? You're going to plug it into your wall and use it as a communication device. They have sucked us in.[19]

General Jumper further describes the complexity of information gathering during his visit to an Air Operations Center. "We've got to come to this notion of how to interweave these (information gathering systems) platforms. All I need you to do is tell me if this thing is what I think it is or not. It's going to take five seconds of your time then you go back to doing whatever else somebody else wants you to do."[20] It is clear that we now process more information than ever before. This gluttony of information poses clear physiological and psychological disadvantages to the users.

STRESS

Today's world has become so broadly defined by information technology that it's becoming increasing clear that the information revolution is also serving as one of our greatest stressors.[21] High stimulation found in today's society leaves many people complaining about being overwhelmed. The Army Physical Fitness Research Institute (APFRI) located at Carlisle Barracks, Pennsylvania, has dedicated research on the effects of stress to senior leaders and executives. Faced with the intensity of government and corporate life, senior leaders and executives are overwhelmed with multiple challenges. "We demand far faster access to information, quicker decision cycles, increased productivity, and measurable improvements on our watch, often with the implied if not explicit zero-defects result. We are constantly connected to the work realm by computers, pagers, cell phones and video conferencing."[22] This mentality is embedded in our world but has created unintended consequences in regards to our health. The U.S. Army War College *Guide to Executive Health and Fitness* examines the "intensity" of work, the interaction of hard work in the workplace. Medical, physiological, and cardiovascular concerns regarding occupational intensity begins when the pace of jobs and life accelerate to the point where there is a physiological effect to individuals.[23] The overwhelming fast paced life that some of this information technology fosters is literally killing people.

David Lewis of the International Stress Management Association originated the phrase "information fatigue syndrome." Similar to studies made by APFRI, Lewis' study shows that the barrage of data to which we are constantly exposed carries a physical and mental cost.[24] David Shenk, in his second book, *Data Smog: Surviving the Information Glut* sites psychological studies spanning thirty years concluding "a wide variety of effects from information and stimulus overload."[25] The research found an increase to cardiovascular stress, confusion, frustration and impaired judgment, decreased benevolence and overconfidence coupled with decreased accuracy.[26] Dr. Theodore Gross, an expert on attention deficit disorders, is currently conducting a study on the effects of the information explosion and the diminishing attention span of today's society.[27]

While Shenk and Lewis may have been describing psychological studies of upper management in the business world, the effects of information overload are also a real threat to decision makers within the Department of Defense.

LEADING THE FORCE

Information overload is not only a function of the volume of information. It is a gap between the volume of information and the tools we have to assimilate the information into useful knowledge. Data that is irrelevant to the task is "white noise." Individuals "spend energy to ignore it" says Alex Neihaus, senior marketing manager at IBM's Lotus Developmental division.[28] The challenge is to get the most relevant, meaningful, contextual information so it can be turned into useful knowledge. Through information technology, the DOD has achieved marked increases in the lethality of its forces. Near real–time delivery of information to decision makers has led to the convergence of tactical and operational level of operations. The vision of attaining "reachback" capability has been seen as minimizing the risk of placing American troops in harm's way. There is a belief that information technology will enable the Joint Force Commander (JFC) to command and control forces efficiently. Terrestrial platforms will allow greater views of the battlespace. There is a high confidence level in the information seen by decision makers. The Army's Future Combat System, LANDWARnet, the Navy's FORCEnet, as well as the vision of the TSAT constellation creates a virtually seamless flow of information from the lowest echelons, giving the JFC a significantly increased knowledge base from which to coordinate, synchronize, and employ forces. This architecture allows knowledge to be shared nearly simultaneously and in near real-time throughout the chain of command. The sight picture developed by advanced information technology provides the decision maker greater situational awareness allowing near simultaneous offensive operations.[29] The actions result in

greater cohesion and unity of effort. However, a major tenet of command and control, centralized control and decentralized execution, hangs in the balance.

CENTRALIZED CONTROL/DECENTRALIZED EXECUTION

One of the most difficult problems that confront any commander who has committed his forces in accordance with a well-developed plan is to alter the operation in light of changing circumstances. Sun Tzu recognized the inherent difficulties, both intellectual and physical, and repeatedly emphasized that the nature of war is ceaseless change.[30] Information technology is able to rapidly reflect change and provides the ability to display more information into the warfighting process. Ultimately, the strategic level span of control will be expanded and could cause the streamlining of the operational chain of command. Senior leaders thousands of miles away have the capability to make more decisions traditionally left to tactical and operational commanders. This new construct will result in a flatter command structure not currently in place today.

A flatter structure may not always be beneficial. Lieutenant General Michael Short, Joint Forces Air Component Commander during Operation Allied Force shared his frustrations in many public forums. During a panel discussion at the Air Force Association National Symposium in 2000 he brought the point home.

> About 45 days into the war, Predator was providing great coverage for us. …we had live Predator video of three tanks moving down the road in Serbia and Kosovo. We had a FAC [Forward Air Controller] overhead and General Clark [Gen. Wesley K. Clark, SACEUR] had the same live Predator video that I had. "Mike, I want you to kill those tanks." I quickly responded, I had something else in mind, "Boss, I'll go after that for you." When shift time came, [Maj. Gen.] Garry Trexler was on the floor, finishing up in the daytime, and Gelwix arrived to take the night shift. I was there because the SACEUR wanted those three tanks killed. We had a weapon school graduate on the phone talking direction to the FAC on the radio. [The] call went something like this: "A lot of interest in killing those tanks, 421. I'd like you to work on it." "Roger." Two or three minutes went by, and 421 clearly had not found those tanks. The young major's voice went up a bit and said, "ComAirSouth, and SACEUR are real interested in killing those tanks. Have you got them yet?" "Negative." About two more minutes went by and the weapons school graduate played his last card. "General Short really wants those tanks killed." And a voice came back that I've heard in my house for the better part of 30 years and he said, "[expletive deleted], Dad, I can't see the [expletive deleted] tanks!"

The incident illustrates how information technology can "drag" strategic and operational thinkers into the tactical level. There are other similar lessons throughout history of a narrowing of focus leading to the possible tendency for senior leaders to relive their "frontline fighting days."

Air Force Doctrine Document 1, the USAF capstone doctrine document, highlights the tenet of centralized control with decentralized execution as crucial to the effective application of air and space power. This tenet compliments the principle of unity of command. Decentralized execution of air and space power is the delegation of execution authority to responsible and capable lower level commanders to achieve effective span of control and to foster disciplined initiative, situational responsiveness, and tactical flexibility. However, numerous forces are changing the applicability of that doctrine. U.S. involvement in wars with limited aims, combined with the technology which allows senior commanders to see the common operational picture and view from the cockpit is driving a trend towards the centralization of air power execution. At the same time, the development of NCW can either centralize or decentralize the control and execution of air power. Over centralization of planning and execution by a staff far from the battle can be deleterious. Air Force doctrine actually addresses the temptation towards centralized execution. The following is an excerpt from AFDD-1:

> Modern communications technology provides a temptation towards increasingly centralized execution of air and space power. Although several recent operations have employed some degrees of centralized execution, such command arrangements will not stand up in a fully stressed, dynamic combat environment, and as such should not become the norm for all air operations. Despite impressive gains in data exploitation and automated decision aids, a single person cannot achieve and maintain detailed situational awareness when fighting a conflict involving many simultaneous engagements taking place throughout a large area. A high level of centralized execution results in a rigid campaign unresponsive to local conditions and lacking in tactical flexibility. For this reason, execution should be decentralized within a command and control architecture that exploits the ability of strike package leaders, air battle managers, forward air controllers, and other front-line commanders to make on-scene decisions during complex, rapidly unfolding operations. Nevertheless, in some situations, there may be valid reasons for execution of specific operations at higher levels, most notably when the JFC (or perhaps even higher authorities) may wish to control strategic effects, even at the sacrifice of tactical efficiency. [31]

U.S. Army FM 100-6 adds "The accuracy, lethality, and range of modern weapons have forced commanders to disperse their formations, decentralizing control and execution. The speed and pervasiveness of data transmission in the Information Age are causing a revolutionary change in the nature of military operations and warfare."[32]

ANALYSIS PARALYSIS

Information overload has flooded our society with a proliferation of "expert opinion." With the widening pool of elaborate studies and arguments on every side of every question, more expert knowledge has, paradoxically, led to less clarity. This phenomenon is known as

"analysis paralysis."[33] The endless analysis is so overwhelming; some experts in the field believe it is becoming difficult to know how and when to decide.[34]

As discussed above, communication among all echelons will shift dissemination and collection of intelligence, targeting and other data from hierarchical to a non-hierarchical command structure. As the strategic span of control increases, whether through simple e-mail traffic or complex Military Satellite Communications networks, there could be a gravitation to coordinate tactical operations at higher levels. Theoretically, everyone from the White House, the Joint Staff and the Combatant Commander Staffs, down to the tactical level could have access to the same data. Each organization would feel compelled to analyze the information and provide feedback. As we have seen in recent military operations, some operational and tactical level decisions could come from the White House or the Joint Staff. Information technology may unintentionally affect the relationship between echelons by limiting the organization's initiative, ingenuity, and inventiveness through monitoring by superiors. Retired U.S. Air Force Major General Perry M. Smith, identified initiative, ingenuity and inventiveness as key traits required for military leaders. These traits within our leaders make the U.S. military a formidable force and anything that adversely affects these traits should not necessarily be considered good for the force.[35]

Increased theater awareness and the ability to transmit the information pose several problems for subordinate commanders. There is a great fear that senior commanders and staff will second-guess every decision. Will a senior leader allow his or her subordinate commander to operate under their own prerogatives or will he redirect efforts? The outcome will likely be determined by the senior officer's personality but the fact that higher-level intervention during execution is possible, it may not be desirable.

THE CNN EFFECT

Information age technology and the proliferation of 24/7 news networks have created the so-called "CNN effect" on strategic level decision-making and how warfighters direct their commands. The pressures for information are enormous. Twenty-four hour cable news networks have a hypnotizing effect on the public. During a recent visit to FOX News, it was revealed the target sound bite is a mere seven seconds. In a world where a picture is worth a thousand words, short video clips fill the airways everyday. Embedded news reporters and cameramen travel with fighting forces and are able to transmit their reports in near real time. The airwaves are flooded with former military officers who as "military analysts" provide their interpretation of military operations. Photographs and video clips have also made their way

onto the Internet affecting world opinion. The causal effect of this coverage is that the available reaction time to events for civilian policy makers is going to decrease because of heightened public interest. Information availability has created an American society that demands more information from their senior civilian and military leaders. What is the effect for senior leaders? The pressure to ask questions, second guess field commanders, and demands for a quick response will engulf the policy maker. The JFC and his staff are forced to make larger number of inquiries to satisfy the policymakers, media and public. Unfortunately, one answer will likely generate more questions. The data smog might inadvertently increase distractions by requiring quick answers to endless questions from the chain of command. The subordinate staffs have been downsized over the past several years and are less capable of handling queries and are thus, distracted disproportionately. There is an assumption that the information age will reduce the overall size of the force required to manage it. The glut of information available may cause an increase in the size of the force. The information age may have caused an increase in bureaucracy in order to maintain efficiency. [36]

TRAINING

> …new equipment can catalyze new behavior and make new tactics possible, and that's laudable. But it's the behavior that counts - new tactics, new processes, new doctrine, new organizational structures, new information flows. That's where the transformation is, and it all involves people advancing new ideas …

> - Arthur K. Cebrowski, Former U.S. Department of Defense
> Director of Force Transformation

Understanding the commander's intent is essential in achieving desired effects in warfare. When data and information are obtained and sorted, decision makers must process the information into knowledge and pass that to the executor. Joint Publication 6, *Doctrine for Command, Control Communications, and Computer (C4) Systems Support to Joint Operations,* identifies the Cognitive Hierarchy model. Cognition results when the information is filtered through the doctrine, guidance, intent, and experience. The output of this process is knowledge. The central command authority is then able to make decisions and communicate the knowledge to the organization, potentially creating a deeper understanding of a given scenario and course of action.
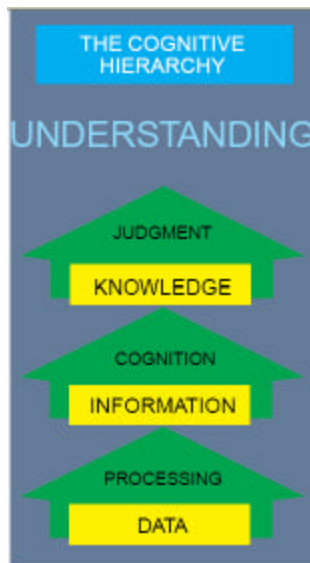
FIGURE 1

NCW outlines three basic tenets that must be understood to successfully implement the theory.
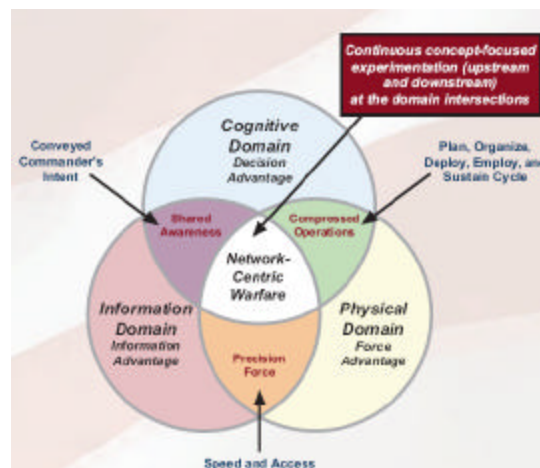

FIGURE 2

Physical Domain: The physical domain is the traditional domain of warfare where force is moved through time and space; the real world. It spans the land, sea, air, and space environments where military forces execute the range of military operations and where the

physical platforms and communications networks that connect them reside.[37] This domain is seen as the easiest to measure, and consequently, combat power has traditionally been measured in this domain.

Information Domain: The information domain is the domain where information is created, manipulated, and shared.[38] It is the domain that facilitates the communication of information among warfighters. It is here where the linkage between the real world and the human consciousness, or cognitive domain is made. It is where command and control (C2) of military forces is communicated and the commander's intent is conveyed. Consequently, it is increasingly the information domain that must be protected and defended to enable a force to generate combat power in the face of offensive actions by an adversary. [39]

Cognitive Domain: The cognitive domain exists in the mind of the warfighter. This is the realm of effects based operations. Battles, campaigns, and wars are won in this domain. The intangibles of leadership, morale, unit cohesion, level of training and experience, and situational awareness are elements of this domain.[40] This is the domain where a commander's intent, doctrine, tactics, techniques, and procedures reside. This is also where decisive battlefield concepts and tactics emerge.

Reports indicate that network-centric skills are neither easily acquired nor retained and require a steep learning curve for leaders and their subordinates. Extensive training is required in order to master the operations of complex NCW systems-of-systems. The current generation of complex information technology tools has only added to an already heavy individual and collective training burden. Accordingly, commanders are making hard choices about the amount of training that subordinates receive and often find the time by sacrificing other training. The lack of an institutionally based, Army-wide network -centric training strategy makes the situation worse. Net-centric expertise, the knowledge to effectively use the systems in combat, currently rests with highly talented contractors, not with uniformed personnel.

The Office of Force Transformation (OFT) is the catalyst for cultural change with in the Department of Defense.[41] Joint Forces Command (USJFCOM) is the link to execute the training. The Joint National Training Capability, an initiative being developed and implemented through USJFCOM's Joint Warfighting Center (JWFC), serves as the heart of training transformation. This enhanced training capability is one of three focal points in the secretary of defense's Training Transformation Plan. It covers the full spectrum of warfighter decision-making - from the strategic and operational to tactical levels of war - and helps the DOD identify and correct potential gaps and seams before real military operations commence.

As JWFC continues to enhance training to the forces it is imperative that systems have the robustness to include intangibles such as commander's intuition, and experience not found in electrons. There is a danger that factors that cannot be quantified will be disregarded and commanders not near the action will be "partly conditioned" by the technology available to them.[42] This can result in stifling of innovation, initiative and boldness from subordinate commanders.

The commander of the USJFCOM is not only the lead agency responsible for the conduct of joint training and advancing interoperability within the DOD, as North Atlantic Treaty Organization's (NATO) Supreme Allied Commander Transformation, he is also responsible for the transformation of NATO military structures, forces and capabilities. NCW and its inherent advanced capabilities threaten to widen the capabilities gap between NATO and other coalition forces.

COALITIONS

> America will implement its strategies by organizing coalitions – as broad as practicable – of states able and willing to promote a balance of power that favors freedom.
>
> > - The National Security Strategy of the United States of America

Maximized effects of the information age have caused the potential for undesired outcomes within its service component. The stress of information proliferation for senior leaders and the troops they lead are exacerbated when relating to the lack of interoperability of U.S. forces with coalition forces.

Coalitions have become a fundamental tool of United States diplomacy. It has enabled the United States to draw upon other nations' forces to help face the challenges of "policing" our world. From Operation Desert Shield/Desert Storm, Kosovo to Operation Iraqi Freedom, the United States has relied on its coalition partners to help in either the warfare or peacekeeping segments of any major military intervention. A digitized DOD creates an even greater disparity in capability between the U.S. forces and coalition forces with whom we operate. Our coalition partners do not possess the same resources and integrated systems as the U.S.

Nation states that make up coalitions and alliances face a daunting task. Even our closest allies lack the interoperability to "plug in" to our systems. What happens to nations who want to offer support but lack the resources? European countries have slashed their defense budgets to an average below two per cent of their Gross Domestic Product.[43] U.S. spending on defense research and development is four times greater than European counterparts.[44] The security

implications surrounding the use of NCW architecture present additional challenges to effective coalition operations. NATO has attempted to address the issue of transformation.

In 2002, The Prague Summit launched three key military transformation initiatives: The Prague Capabilities Commitment (PCC), the NATO Response Force and the new NATO Command Structure. The latter creating the NATO Supreme Allied Command Transformation discussed earlier. The PCC directly addresses improved interoperability of forces as well as command, control and information superiority. The September 2002 National Security Strategy articulates the need to "take advantage of the technological opportunities and economies of scale in defense spending…and diminish our vulnerabilities."[45] While numerous areas for improvement have been identified, success will depend on funding. Until then, coalitions and alliances will be unable to contribute equally in high-end operations, worsening the perception of major European partners' unwillingness to take on their fair share of the world burden.

CONCLUSION

> …a future force that is defined less by size and more by mobility and swiftness; one that is easier to deploy and sustain; one that relies more heavily on stealth, precision weaponry and information technologies.
>
> - George W. Bush

> Improvement will require not only technological solutions, but also cultural change—a willingness to challenge standard practices, and question current organizational patterns and command practices.
>
> - General Richard B. Myers, Chairman Joint Chiefs of Staff

The DOD is transforming. The advancement of information technology has increased the warfighter's lethality through the ability to better focus and synchronize combat power. As the OFT states in the *Military Transformation: A Strategic Approach*, "Our ability to capitalize on new sources of power will determine, in part, our success in the future."[46] Information technology provides senior leaders full spectrum domination of the battlespace by integrating information and knowledge.

As the force transforms, leaders will remain the key to managing it. Decision makers must recognize that too much intervention can lead to reduced efficiency, stress to subordinates, and loss of flexibility. Information overload or over reliance of a given system can incapacitate forces relying on NCW. Transformation must not erode the tenet of centralized control and decentralized execution.

The Office of Force Transformation must ensure that education and training is accomplished across the command hierarchy. As executive agent, USJFCOM must emphasize the proper functions and application of emerging technologies as they relate to strategic, operational and tactical warfare. Leaders must understand the cognitive domain. Understanding the effects of NCW on operations and the consequences of using emerging information technology to make tactical decisions at the operational and strategic levels is a leadership responsibility.

Advancements in information technology will not eliminate the fog and friction of warfare. Information technology and its by products described in this paper has introduced another source of friction that senior leaders must now contend with. Today's subordinates are the future leaders of tomorrow.   It is imperative that they command and execute at the tactical level. In his book *Taking Charge*, Major General Perry M. Smith describes the fundamentals of leadership. "Leadership functions must be shared with 'lieutenants'."[47] It is imperative that senior leaders nurture the potential of their subordinates. Senior leaders need to exert discipline to avoid the temptation of tactical command. Subordinates need to understand the relationship between strategy and tactics and trust their commanders. Information technology is the future of our fighting force. Joint Vision 2020 articulates, "The joint force must be able to take advantage of superior information converted to superior knowledge to achieve 'decision superiority'."[48] There are ways to handle the overload. Doctrinal adaptations as well as relevant training are keystones in managing the advancement of information technology in the battlefield. As seen in Air Force doctrine, the tenet of centralized control and decentralized execution must be the rule not the exception. The Department of Defense must better manage emerging technology by understanding some of its undesired effects. Senior leaders cannot be mesmerized by technological innovations while losing sight of the human and psychological factors found in command. The military as a profession may hang in the balance.

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